Indirect Effects of Elevated CO_2 on a Salt Marsh Herbivore

Authors: Jes Hines, Robert Denno, Bert Drake
University of Maryland, College Park

Keywords: climate change, elevated CO_2, salt marsh, food web interactions, herbivory

Predicted changes in global atmospheric CO_2 levels can alter plant productivity and chemical composition (C:N) and therefore lead to altered interactions between plants and other trophic levels. Most elevated CO_2 research has focused on the direct effects of elevated CO_2 on mesocosms containing one plant species or one plant and one herbivore. However, there has been a recent drive to examine how elevated CO_2 will potentially affect reticulate food web interactions and naturally complex community assemblages. I investigated the interactions between *Scirpus olneyi* (a C3 sedge), *Spartina patens* (a C4 grass), an assemblage of phloem-feeding planthoppers, and their invertebrate predators in elevated and ambient CO_2 field chambers on a Mid-Atlantic salt marsh. Previous research has shown that elevated CO_2 consistently alters the growth rate and nitrogen content of *Scirpus olneyi*, but not *Spartina patens*. Thus, under elevated CO_2 conditions, rapidly growing *Scirpus* often shades and alters the microclimate of *Spartina patens*, the only host plant of the dominant phloem-feeding planthopper *Delphacodes detecta*. In the presence of non-host plant *Scirpus olneyi*, there were significant decreases in *Delphacodes* fitness as indexed by development time, survivorship, and body size. Moreover, there was a significant interaction between plant community composition and CO_2 treatment whereby the combination of elevated CO_2 and the presence of *Scirpus olneyi* led to a larger decrease in *Delphacodes* performance than could be attributed to either factor alone. Results of this study emphasize the importance of examining indirect trophic interactions and multi-species assemblages when considering the potential impacts of global climate change on natural communities.

Point of Contact:
Jes Hines
Student
University of Maryland, College Park
4112 Plant Sciences
College Park, MD 20742
301-405-7518
hines@umd.edu